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High-resolution magneto-optical spectroscopy of LiYF4 7: Er 3+ 167, Er 3+ 166 and analysis of hyperfine structure of ultranarrow optical transitions

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Abstract

© 2016 American Physical Society.We performed high-resolution magneto-optical spectroscopy of the hyperfine transitions from I15/24 to the I13/24 and I9/24 multiplets of Er3+167 and Er3+166 in an isotopically purified LiYF47 crystal in various external magnetic fields up to 0.7 T. The obtained experimental results are interpreted in the framework of the generalized theoretical approach. The derived model successfully explains all the experimentally observed optical hyperfine transitions by using a single set of basic parameters found for the crystal-field interaction, magnetic dipole and electric quadrupole hyperfine interactions, together with Zeeman interactions at different orientations of the external magnetic field. A number of the studied quantum transitions appears to be promising for use in Raman quantum storage at optical telecommunication wavelengths.

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